

1.	Patent Number	049191406
2.	Application Type	1
3.	Issue Date	04/24/90
4.	Serial Number	7258142
5.	Filing Date	10/14/88
6.1.1	Foreign Priority Ctry. Code	ZZX
7.	State/Country Number	18
8.	Title	Method and apparatus for regenerating nerves
9.	Entity	SR
11.	Assistant Examiner	Manuel; George
12.	Primary Examiner	Jaworski; Francis
13.	Number of Sheets	2
14.	Number of Figures	3
16.	Date Fee Paid	02/12/90
17.	Class/Subclass	128/422
18.	Group Art Unit Number	335
19.1.1	Cross Reference Class	128
19.2.1	Cross Reference Subclass	421;419-R;784
20.	International Class Type	5
21.1.1	International Class	A61N
21.2.1	International Subclass	1/00
22.1.1	Field of Search Class	128
22.2.1	Field of Search Subclass	421;422;419 F;419 R;783;784
23.	Print Claim Number	1
24.	Total Claims	11
26.1.1	Line 1 Address	Barnes & Thornburg
26.2.1	Line 2 Address	1313 Merchants Bank Building

3/6 1 of 2 good

26.3.1	Line 3 Address	<u>11 South Meridian Street</u>
26.4.1	Line 4 Address	<u>Indianapolis, IN 46204</u>
27.1.1	Attorney	<u>Barnes & Thornburg</u>
29.1.1	Assignee Name	<u>Purdue Research Foundation</u>
29.2.1	Assignee Code	02
29.3.1	Assignee City	<u>West Lafayette</u>
29.4.1	Assignee State	<u>IN</u>
30.1.1	Inventor Name	<u>Borgens; Richard B.</u>
30.3.1	Inventor City	<u>Delphi</u>
30.1.2	Inventor Name	<u>McGinnis; Michael E.</u>
30.3.2	Inventor City	<u>West Lafayette, both of</u>
30.4.2	Inventor State	IN
32.1.1	U.S. Patent Number	<u>4,611,599</u>
32.2.1	U.S. Patent Date	<u>09/00/1986</u>
32.3.1	U.S. Patentee Name	Bantall et al.
32.4.1	U.S. Patent Class	128
32.5.1	U.S. Patent Subclass	422
32.1.2	U.S. Patent Number	<u>3,817,254</u>
32.2.2	U.S. Patent Date	<u>06/00/1974</u>
32.3.2	U.S. Patentee Name	<u>Maurer</u>
32.4.2	U.S. Patent Class	128
32.5.2	U.S. Patent Subclass	<u>421</u>
32.1.3	U.S. Patent Number	<u>3,893,462</u>
32.2.3	U.S. Patent Date	<u>07/00/1975</u>
32.3.3	U.S. Patentee Name	Manning
32.4.3	U.S. Patent Class	128
32.5.3	U.S. Patent Subclass	419 F
32.1.4	U.S. Patent Number	<u>4,084,595</u>
32.2.4	U.S. Patent Date	<u>04/00/1978</u>
32.3.4	U.S. Patentee Name	<u>Miller</u>

32.4.4	U.S. Patent Class	128
32.5.4	U.S. Patent Subclass	422
32.1.5	U.S. Patent Number	4,774,967
32.2.5	U.S. Patent Date	10/00/1988
32.3.5	U.S. Patentee Name	<u>Zanakis et al.</u>
32.4.5	U.S. Patent Class	<u>128</u>
32.5.5	U.S. Patent Subclass	785
34.1.1	Other References	<p>McCaig, Colin D., [37 <u>Spinal Neurite</u> <u>Reabsorption and Regrowth in vitro</u> <u>Depent on the Polarity of an Applied</u> <u>Electric Field</u>, [38 [i <u>Development</u>, [1 100, 31[14 41, (1987).</p>
34.1.2	Other References	<p>Borgens, Richard B., A. Blight, D. Murphy & L. Stewart, [37 <u>Transecte</u> <u>Dorsal Column Axons Within the Guinea</u> <u>Pig Spinal Cord Regenerate in the</u> <u>Presence of an Applied Electric</u> <u>Field</u>, [38 [0 [i <u>Journal of</u> <u>Comparative Neurology</u>, [1 250:168[14 180, (1966).</p>
34.1.3	Other References	<p>Borgens, Richard B. <u>a.</u> Blight and M. ← McGinnis, [37 <u>Behavioral Recovery</u> <u>Induced by Applied Electric Fields</u> <u>after Spinal Cord Hemisection in</u> <u>Guinea Pig</u>, [38 [0 [i <u>Science</u>, [1 238:366[14 369, (Oct. 16, 1987).</p>
34.1.4	Other References	<p>Wallace, M. Christopher, C. Tator and I. Piper, [37 <u>Recovery of Spinal Cord</u> <u>Function Induced by Direct Current</u> <u>Stimulation of the Injured Rat Spinal</u> </p>

Cord, [38 [0 [i Neurosurgery, [1 vol. |
20, No. 6, Part I, (1987).

34.1.5 Other References

Politis, Michael J. and Michael F. |
Zanakis, [37 Short Term Efficacy of |
Applied Electric Fields in the Repair |
of the Damaged Rodent Spinal Cord: |
Behavioral and Morphological |
Results [38 .

34.1.6 Other References

M. F. Zanakis and M. J. Politis, [37 |
Short Term Bahavioral and |
Histological Changes in the Damaged |
Rat Spinal Cord Following Application |
of D.C. Electric Fields, [38 [0 |
(Abstract).

34.1.7 Other References

M. Khan, M. J. Politis and D. |
Munoz [14 Garcia, [37 The Effect of |
Localized Oriented Electric Fields on |
Regenerative Changes in Double |
Hemisected Spinal Cord of Rats, [38 |
[0 Canadian Congress of Neurological |
Sciences, Jun. 25 [14 27, 1987, |
(Abstract).

34.1.8 Other References

Berry, M., [37 Regeneration in the |
Central Nervous System, [38 [0 [i |
Recent Advances in Neuropathology, [1 |
Ch. 4, (1st ed. 1979), (Editors: W. |
T. Smith and V. B. Cavanaugh).

34.1.9 Other References

Kiernan, J., [37 Hypotheses Concerned |
with Axonal Regeneration in the |
Mammalian Nervous System, [38 -[0 Biol. |

Rev., 54:155[14 197, (1979).

34.1.10 Other References

Borgens, Richard E. and Michael E. |
McGinnis, [37 Artificially |
Controlling Axonal Regeneration and |
Development by Applied Electric |
Fields, [38 [0 Chapter 4, [i Electric |
Fields in Vertebrate Repair, [1 |
(1989).

34.1.11 Other References

[37 Final Thrusts Prepared in RES, [38. |
[0 [i Spinal Cord Society Newsletter, |
pp. 3[14 4, (Jun. 1987).

35. Abstract Code

1

36. Abstract

A method and apparatus for stimulating nerves
in the central nervous system of a mammal to regenerate
within the central nervous system applies an oscillating
electrical field to the central nervous system across a
lesion in the central nervous system. The polarity
reversal period of the electrical field is long enough
to stimulate growth of cathodally facing axons of the
nerve cells in the central nervous system but is shorter
than a die back period of anodally facing axons of the
nerve cells.